

Docket No.: ATODP0100US**Serial No. 10/675,019****Remarks**

Claims 1-43 are pending in the application. Claims 1, 12, 13, 15-20, 22, 28, 33, 34, 36, 41 and 42 are amended and claims 21 and 23 are cancelled herein. Claims 1, 28 and 36 are amended to incorporate the composition described in original claim 16, and to specify that the metal layer comprises a layer of copper and a layer of a second metal or alloy, as originally specified in original claims 13, 34 and 42. Claims 12, 33 and 41 are amended to recite that the metal layer displays a galvanic edge effect only at the outermost edges of the metal layer prior to the etching, as supported, e.g., in Fig. 7b and accompanying text. Claims 13, 34 and 42 are amended to recite that, subsequent to the etching, elements of the circuit pattern are substantially free of a galvanic edge effect, as supported, e.g., in Fig. 7c and accompanying text. Claim 15 is amended to correct a typographical error. Claim 16 is amended to specify the oxidant, corrosion inhibitor and acid, and is supported, for example, at page 34, lines 4-5. Claims 17 and 18 are amended to change dependency from original claim 16 to amended claim 1. Claims 19 and 20 are amended to identify components of original claim 19 as optional additional elements of the composition in amended claim 1. Claim 22 is amended to identify components of original claim 22 as optional additional elements of the composition in amended claim 1. Applicants respectfully submit that amended claim 1 is generic to original claims 19 and 22, and so amendment of these claims to depend from claim 1 does not constitute re-entry of withdrawn species into the application.

Applicants respectfully submit that the presently presented claims fully patentably distinguish over the prior art of record, for at least the reasons set forth in the following. Reconsideration of the application, withdrawal of the rejections, and allowance of the claims is respectfully solicited.

Rejection of Claims over Murakami et al.

Claims 1-4, 8-10, 12, 13, 26 and 27 stand rejected as anticipated by Murakami et al., U.S. Patent No. 5,028,513. Claims 14 and 16 were not rejected over Murakami et al.

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and since the subject matter of these claims is now incorporated into claim 1, this rejection is considered moot. Accordingly, Applicants respectfully request withdrawal of the rejections over Murakami et al.

Rejection of Claims over Andresakis et al. Alone and In Combination

Claims 1-4, 8-12, 26-33 and 36-41 stand rejected as anticipated by Andresakis et al., U.S. Patent No. 6,500,339. Claims 5-7 stand rejected as obvious over Andersakis et al. in view of U.S. Patent No. 6,562,149 to Greiser et al., U.S. Patent No. 6,036,758 to Fairweather, and U.S. Patent No. 4,637,899 to Kennedy, Jr. Claims 13-15, 34, 35, 42 and 43 stand rejected as obvious over Andresakis et al. in view of U.S. 2003/0029730 to Lee et al. Claims 5, 16-18, 24 and 25 stand rejected as obvious over Andresakis et al. in view of U.S. Patent No. 6,261,466 to Bayes et al. Applicants respectfully traverse the rejections of all of these claims as based in any way on Andresakis et al.

Applicants respectfully submit that Andresakis et al. fails to disclose or suggest a step of micro-roughening a mixed-metal layer as claimed, and therefore cannot have rendered obvious and of the presently pending claims, since at least one element of the these claims is wholly missing.

Since the claims have been amended to incorporate the features of claim 16 and the features of claims 13, 34 and 42, the hypothetical rejection of the claims over the combination of Andresakis et al., Bayes et al. and Lee et al. is addressed in the following.

Applicants note that the primary reference, Andresakis et al., suggests that its bond-enhancement surface preparation could be used on an unpatterned metal layer, but Andresakis et al. do not suggest that the bond-enhancing treatment be replaced by any other or that it is for anything but preparation for forming the initial copper foil/polymer composition laminate. Nor does Andresakis et al. suggest that a mixed-metal layer could be substituted for the single metal layer to which its method is applied. Thus, Applicants respectfully submit that there is no motivation in Andresakis et al. to make the modifications necessary to substitute a wholly different etching process for its pretreatment,

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and furthermore, there is no motivation to modify the metal to a mixed metal layer, and certainly there is no motivation to make simultaneously the two substantial modifications necessary to wholly change the chemistry as well as to wholly change the metal layer to which the method is applied, as would be necessary at a minimum to support a contention that the presently claimed invention would have been obvious.

Applicants respectfully submit that the process of Bayes et al. is disclosed and taught as useful only for treatment of copper circuitry after the circuit patterns have been formed, not as a treatment for an unpatterned metal layer, prior to any such circuit pattern formation. Furthermore, there is no suggestion that the method of Bayes et al. might be applicable to a mixed-metal layer, such as that claimed. Applicants note that Bayes et al. discloses at col. 1, lines 20-24 and 38-46:

Circuit layers are formed by applying a copper layer onto a polymeric substrate. Printed circuits are then formed on the copper layers by techniques well known to the art, for example print and etch to define and produce the circuit traces—i.e., discrete circuit lines in a desired circuit pattern.

* * *

Prior to lamination and through hole formation, the discrete copper circuit lines are typically treated with an adhesion promoter to improve bond strength between each circuit layer and adjacent interleaving dielectric resin layers. One method used by the art to improve bond strength involves oxidative treatment of the copper circuit lines to form a copper oxide surface coating on the circuit lines. The oxide coating is usually a black or brown oxide layer that adheres well to the copper.

In addition, Bayes et al. discloses, at col. 6, lines 21-26:

In use of the formulation, copper, or a copper alloy surface is cleaned by mechanical or chemical cleaning and then contacted with the adhesion promoter. The copper surface may have previously been provided with a tarnish-inhibiting coating e.g. by incorporating the tarnish inhibitor into a resist stripping composition used in an *immediately preceding step of etch resist stripping*. (Emphasis added.)

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Which is soon followed, at col. 6, lines 46-48, by the following:

The process can be used to replace the black copper oxide adhesion promotion step in a considerably reduced number of steps.

Thus, it is clear that Bayes et al. views the black oxide treatment for which its composition can be substituted to be the black oxide treatment *following* the pattern formation and not as claimed by Applicants, to be applied to an unpatterned metal layer.

Furthermore, there is no suggestion in Bayes et al. to replace the copper layer discussed therein with a mixed-metal layer such as that now claimed. In addition, there is no basis in Bayes et al. to suggest, on a chemical basis, that its particular chemical treatment possible could be applied to or would work on mixed-metal circuitry.

Therefore, Bayes et al. discloses only that its treatment could be used in a post-pattern formation step. There is no suggestion in Bayes et al. that the treatment would be suitable for use on an unpatterned metal surface, prior to any pattern formation, no motivation to substitute its composition for any pre-treatment step, and no motivation to apply the Bayes et al. treatment to mixed-metal circuitry.

Regarding the rejection of claims 13-15, 34, 35, 42 and 43 over Andresakis et al. in view of U.S. 2003/0029730 to Lee et al., the Examiner contended:

Andresakis et al. teach the method of the invention substantially as claimed, but does not expressly teach using a layer of copper and a layer of 65% iron and 36% nickel. However, Lee et al teach that Copper-invar-copper (CIC) may be used to form circuit elements having low thermal expansion. It would have been obvious to one of ordinary skill in the art at the time of invention to use the copper-invar-copper composite of Lee et al. in the method of Andresakis in order to form circuit elements having low thermal expansion. Note Lee et al. also teaches that the CIC material may be treated to improve adhesion properties. (Paragraph 41)

Applicants respectfully traverse the rejection of claims 13, 34 and 42 (now claims 1, 28 and 36) over Andresakis et al. in view of Lee et al. for at least the following reasons.

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Lee et al. relates to a new method for forming a CIC metal layer, wherein the copper is electrodeposited onto the iron/nickel layer, to form the CIC mixed-metal layer. Lee et al. mentions in [0041] that "surface treatment typically applied to copper to promote adhesion of a dielectric substrate or to provide other properties" may be applied. However, micro-roughening, such as that disclosed and claimed herein, is not mentioned or suggested in Lee et al. The methods mentioned in Lee et al. are, in [0043], electrolytic deposition of nodular or dendritic copper or copper oxide in nodular or dendritic form, and in [0044], the mechanical roughening of the copper layer. Lee et al. also disclose in [0051] the use of a silane adhesion promoting layer. As noted, Lee et al. do not disclose any micro-roughening as presently disclosed and claimed.

Most importantly, Lee et al. fail to recognize the problem recognized and solved by the present invention - the problem of galvanic edge effects which occur when the mixed-metal layer is roughened by an oxidative process in which an edge effect would occur due to the two different metals in the mixed-metal layer or circuitry. The only recognition of this problem is in Applicants' specification, not in Lee et al., not in Bayes et al. and not in Andresakis et al. The only solution to this newly-recognized problem is provided in Applicants' specification - the claimed invention is the solution to this problem.

There is simply no basis for any possible combination of Andresakis et al., Bayes et al. and Lee et al. that would be necessary to support a contention that the presently claimed invention would have been obvious over the three-way combination of these references. Thus, Applicants respectfully submit there is no such obviousness.

For these reasons, Applicants respectfully submit that the presently claimed invention fully distinguishes over the prior art of record and respectfully requests reconsideration and withdrawal of the rejections of the claims, based on the foregoing amendments and arguments.

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Applicant submits simultaneously herewith a Supplemental IDS to cite the International Preliminary Report on Patentability from the corresponding PCT application.

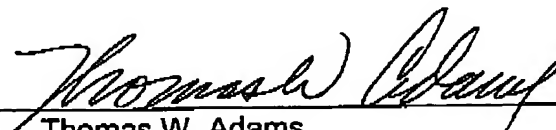
Conclusion

It is respectfully submitted that all of the claims presently in the application are allowable, and that any claims withdrawn from consideration due to previous or the present election of species should be reinstated into the case and allowed.

In the event issues arise as a result of the filing of this paper, or remain in the prosecution of this application, Applicants request that the Examiner telephone the undersigned attorney to expedite allowance of the application. Should a Petition for Extension of Time be necessary for the present Reply to the outstanding Office action to be timely filed (or if such a petition has been made and an additional extension is necessary) petition therefor is hereby made and, if any additional fees are required for the filing of this paper, the Commissioner is authorized to charge those fees to Deposit Account #18-0988, Docket No. ATODP0100US.

Respectfully submitted,

RENNER, OTTO, BOISSELLE & SKLAR, LLP

By 
Thomas W. Adams
Reg. No. 35,047

1621 Euclid Avenue, 19th Floor
Cleveland, Ohio 44115
(216) 621-1113

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